

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A receiving process method of a receiving apparatus used in a mobile communication system in which a sending apparatus sends a plurality of code channels as code channel groups to which spreading codes are assigned to a receiving apparatus, and said receiving apparatus receives said code ~~channels~~ channel groups as received signals, said receiving process method comprising ~~the steps of:~~

when spreading codes used for said code channel groups are orthogonal code sequences,

generating received spreading signal sequences of said code channel groups according to the number of received paths; and

removing a received spreading signal sequences of a received path of own code channel group of said receiving apparatus which should be removed from received signals sequence, from the received signals, that is a replica of a signal of an own code channel group of said receiving apparatus transmitted via a path that is different from another path via which said signal of said own code channel group is transmitted.

Claim 2 (Currently Amended): The receiving process method as claimed in claim 1, further comprising ~~the steps of:~~

when spreading codes of other code channels used for control or used for other channels in said code channel group are orthogonal code sequences,

generating received spreading signal sequences of said code channel groups according to the number of received paths; and

removing received spreading signal sequences of received paths of other code channels which should be removed from the received signals.

Claim 3 (Currently Amended): The receiving process method as claimed in claim 1, further ~~comprising the steps of:~~

when all or a part of said spreading codes used for said code channel groups are non-orthogonal code sequences,

generating received spreading signal sequences of said code channel groups according to the number of received paths; and

removing received spreading signal sequences of other code channels which are non-orthogonal in the same received path from the received signals.

Claim 4 (Currently Amended): The receiving process method as claimed in claim 1, further ~~comprising the steps of:~~

when said receiving apparatus receives a code channel group from another sending apparatus which is not connected to said receiving apparatus,

generating received spreading signal sequences of said code channel group from said another sending apparatus according to the number of received paths; and

removing received spreading signal sequences of said code channel group from received signals of said another sending apparatus.

Claim 5 (Currently Amended): The receiving process method as claimed in claim 1, wherein said receiving spreading code sequence is generated on the basis of an estimated value of channel variations and an estimated value of a data modulation obtained for each code channel.

Claim 6 (Currently Amended): The receiving process method as claimed in claim 5, further comprising ~~the steps of~~:

said sending apparatus sending pilot signals of which said receiving apparatus knows a sending phase and a sending amplitude to said receiving apparatus periodically; and

said receiving apparatus measuring a received phase and a received amplitude of said pilot signals, and obtaining said estimated value of said channel variations by comparing said sending phase and said sending amplitude with said received phase and said received amplitude.

Claim 7 (Currently Amended): The receiving process method as claimed in claim 6, further comprising ~~the steps of~~:

said receiving apparatus obtaining said estimated value of channel variations by averaging said estimated value of channel variations obtained by using said pilot signals and an estimated value of channel variations obtained by comparing decision results of said data modulation with ~~receiving~~ said received phase and said received amplitude for data signals.

Claim 8 (Currently Amended): The receiving process method as claimed in claim 7, further comprising ~~the steps of~~:

obtains said estimated value of channel variations on the basis of said pilot signals, said data signals and said decision results of said data modulation;

updating said data modulation decision results by using said estimated value of channel variations; and

updating said estimated value of channel variations on the basis of said updated data modulation decision results.

Claim 9 (Currently Amended): The receiving process method as claimed in claim 5, wherein the same estimated value is used as said estimated value of channel variations for code channels sent ~~from~~ from the same sending apparatus.

Claim 10 (Currently Amended): The receiving process method as claimed in claim 5, further comprising ~~the steps of~~:

performing coherent detection by using said estimated value of channel variations for received despread signals of data signals obtained by despreading received signals from which said received spreading signal sequences have been subtracted;

wherein, when said receiving apparatus receives signals by path diversity or by antenna diversity, said receiving apparatus estimates data modulation by performing a hard decision for signals on which antenna diversity has been performed.

Claim 11 (Currently Amended): The receiving process method as claimed in claim 5, further comprising ~~the steps of~~:

when said sending apparatus performs data modulation for sending original information data sequences which have been error correction coded beforehand,

said receiving apparatus performing coherent detection by using said estimated value of channel variations for received despread signal of data signals obtained by despreading received signals from which said received spreading signal sequences have been subtracted, performing error correction decoding on signals after ~~performed~~ performing antenna diversity combining when signals were received by path diversity or antenna diversity so that original information data sequences are estimated;

said receiving apparatus performing error correction coding on said original information data sequences which are estimated; and

said receiving apparatus performing data modulation by using data sequences which are obtained by performing error correction coding on said original information data sequences so that data modulation is estimated.

Claim 12 (Currently Amended): The receiving process method as claimed in claim 8, further comprising ~~the steps of~~:

updating said received spreading signal sequences on the basis of updated estimated values of channel variations; and

demodulating code channels ~~to be demodulated~~ by using signals obtained by subtracting said updated received spreading signal sequences from received signals.

Claim 13 (Original): A receiving apparatus which receives code channel groups each including code channels from sending apparatuses, said receiving apparatus including an interference canceler which comprises a plurality of stages,

a first stage of said stages comprising:

a data modulation estimation part and a channel estimation part for estimating data modulation and channel variations for each received code channel which is a subject for interference canceling;

a multiplier for multiplying an estimated data modulation signal by an estimated value of channel variations; and

a received spreading signal sequence generation part for obtaining a received spreading signal sequence for each multipath by performing spreading a received signal by using a corresponding spreading code;

a stage after said first stage in said stages comprising:

an other channel multipath interference canceling part for subtracting received spreading code sequences of other code channels obtained in the previous stage from received signals for each received code channel which is a subject for interference canceling;

an own channel multipath interference canceling part for subtracting received spreading signal sequences of own code channels obtained in the previous stage corresponding to a path which is a subject for demodulation;

a part for preparing signals corresponding to the number of multipaths obtained by subtracting received spreading signal sequences from received signals by said other channel multipath interference canceling part and by said own channel multipath interference canceling part, and updating estimated values of data modulation and channel variations by using said prepared signals;

a received spreading signal sequence updating part for updating received spreading signal sequences on the basis of updated estimated values of data modulation and channel variations;

a last stage in said stages comprising a data demodulation part for demodulating data by using signals obtained by subtracting received spreading code sequences obtained in the previous stage from received signals for code channels to be demodulated.

Claim 14 (Original): The receiving apparatus as claimed in claim 13, said receiving apparatus comprising a first channel variation estimation part for sending pilot signals of which said receiving apparatus knows sending phase and sending amplitude to said receiving apparatus periodically; and for measuring received phase and received amplitude of said pilot signals, and obtaining said estimated value of said channel variations by comparing said sending phase and sending amplitude with received phase and received amplitude.

Claim 15 (Original): The receiving apparatus as claimed in claim 14, said receiving apparatus comprising a second channel variation estimation part for performing estimation of channel variations by averaging said estimated value of channel variations obtained by said first channel variation estimation part and an estimated value of channel variations obtained by comparing decision results of data modulation with receiving phase and amplitude for data signals.

Claim 16 (Original): The receiving apparatus as claimed in claim 15, said receiving apparatus comprising:

a third channel variation estimation part for performing estimation of channel variations on the basis of said pilot signals, said data signals and said decision results of said data modulation;

a data modulation decision updating part for updating data modulation decision results by using an estimated value of channel variations obtained by said third channel variation estimation part; and

a channel variation estimation updating part for updating said estimated value of channel variations on the basis of said updated data modulation decision results.

Claim 17 (Original): The receiving apparatus as claimed in claim 15, wherein the same estimated value is used as said estimated value of channel variations for code channels sent from the same sending apparatus.

Claim 18 (Original): The receiving apparatus as claimed in claim 13, comprising:  
an coherent detection part for performing coherent detection by using said estimated value of channel variations for received despread signals of data signals obtained by

despreading received signals from which said received spreading signal sequences have been subtracted;

a first data modulation estimation part for estimating data modulation by performing hard decision for signals on which antenna diversity has been performed, when said receiving apparatus receives signals by path diversity or by antenna diversity.

Claim 19 (Original): The receiving apparatus as claimed in claim 13, comprising:

a coherent detection part for performing coherent detection by using said estimated value of channel variations for received despread signal of data signals obtained by despreading received signals from which said received spreading signal sequences have been subtracted when said sending apparatus performs data modulation for sending original information data sequences which have been error correction coded beforehand;

an original information data sequence estimation part for performing error correction decoding on signals after performed antenna diversity combining when signals were received by path diversity or antenna diversity so that original information data sequences are estimated;

a second data modulation estimation part for performing error correction coding on said original information data sequences which were estimated, and performing data modulation by using data sequences which are obtained by performing error correction coding on said original information data sequences so that data modulation is estimated.

Claim 20 (Original): The receiving apparatus as claimed in claim 13, comprising:

a data modulation estimation adaptive switching part for switching between a first data modulation estimation part and a second data modulation estimation part for performing estimation of data modulation in each stage of said interference canceler;



said first data modulation estimation part estimating data modulation by performing hard decision for signals on which antenna diversity has been performed, when said receiving apparatus receives signals by path diversity or by antenna diversity;

said second data modulation estimation part performing error correction coding on said original information data sequences which were estimated, and performing data modulation by using data sequences which are obtained by performing error correction coding on said original information data sequences so that data modulation is estimated.

Claim 21 (Original): The receiving apparatus as claimed in claim 13, comprising a subtracting part for subtracting received spreading signal sequences from received signals after multiplying said received spreading signal sequences by predetermined interference removing weight coefficients.